TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT

IMPROVED, REAL-TIME SCREENING DURING EXCAVATION FOR RADIONUCLIDES WITH EMPHASIS ON THE FOLLOWING: URANIUM, PLUTONIUM, STRONTIUM-90, AND TECHNETIUM-99

Identification No.: RL-SS14
Date: September 2001

Program: Environmental Restoration
OPS Office/Site: Richland Operations Office/Hanford Site
Operable Unit(s): All soil sites
PBS No.: RL-RC01 (RL-ER01), RL-RC02 (EL-ER03), RL-CP01 (RL-ER02)
Waste Stream: Disposition Map Designations: ER-04 [technical risk score 3], ER-14 [technical risk score 5], ER-03 [technical risk score 3]
TSD Title: N/A
Waste Management Unit (if applicable): N/A
Facility: N/A

***Priority Rating*:**

This entry addresses the "Accelerated Cleanup: Paths to Closure (ACPC)" priority:

____ 1. Critical to the success of the ACPC
_X_ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
____ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success

***Need Title*:** Improved, Real-Time Field Screening During Excavation for Radionuclides with emphasis on the Following: uranium, plutonium, strontium-90, and technetium-99

Need/Opportunity Category: Technology Need

***Need Description*:** Rapid, field screening techniques are needed to direct characterization, excavation operations, and release of material for transport to disposal. Field screening techniques for characterization and delineation will assure that high cost, site characterization laboratory analyses are optimized. These techniques will also help assure that operations at excavation sites remove all contaminated material and that excavated materials meet waste acceptance criteria prior to disposal. Primary radioactive contaminants requiring improved field detection sensitivities include uranium, plutonium, strontium-90 and technetium-99. In some instances, nickel-63 detection requires improved sensitivity.

Schedule Requirements:

Earliest Date Required: 8/1/99

Latest Date Required: 9/30/18

Soil Remediation is ongoing. Characterization and remediation of the 200 Area sites has begun and is expected to continue through 2018.

***Problem Description*:** The approximate total volumes of soil requiring remediation at the Hanford Site (liquid waste disposal sites and burial grounds) are: 3.9 million cubic yards in the 100 Areas, approximately 10 million cubic yards in the 200 Areas, and 0.8 million cubic yards in the 300 Area. The 100 Area has over 340 contaminated soil sites that are expected to require remediation. Soil units include cribs, french drains, trenches, ponds, and retention basins that received radiologically and chemically contaminated liquid effluent from reactor and support operations. Strontium-90 is a primary radioactive contaminant of concern. The 200 Area contains approximately 1000 different soil and burial ground sites. Soil waste sites are predominantly the result of liquid discharges to cribs, ponds and ditches. The 200 Area remediation include a combination of removal and leave in-place with in situ treatment and/or barrier placement strategies. The target/indicator contaminants will be developed for the 200 Area as part of the characterization activities. However, plutonium, uranium, and strontium are likely to be the key indicator contaminants for many of the contaminated sites. Technetium may be an important contaminant and is currently difficult to detect at the desired levels.

The boundaries for some of these liquid waste disposal sites are poorly defined. Also, other sites may have significantly different contaminant concentrations throughout the site. The baseline strategy for soil sites in the 100 Area is to excavate the top 15 feet of contaminated soil and dispose on site. Portions of the 200 area sites are also anticipated to be excavated and disposed on site. Rapid field screening techniques are required to help direct excavation operations so that all soils contaminated above required levels can be removed. Field screening techniques that support characterization and delineation will also assure that high cost, site characterization laboratory analyses are optimized.

Benefit to the Project Baseline of Filling Need: Improved technologies may have cost and schedule savings compared to the current baseline gamma detectors and discrete sampling.

***Functional Performance Requirements*:** Detection technologies must be portable, easy to use, produce little or no secondary waste and provide real-time field screening. Detection levels must be comparable to cleanup requirements. The following remediation goals can be found in the Remedial Design Report/Remedial Action Work Plan for the 100 Area (DOE/RL-96-17 rev. 2): Ni-63, 4,026 pCi/g; U-233/234, 1.1 pCi/g; U-235, 1.0 pCi/g; U-238, 1.1 pCi/g; Pu-238, 37.4 pCi/g; Pu-239/240, 33.9 pCi/g; Sr-90, 4.5 pCi/g; and Tc-99, 15 pCi/g. The 200 Area sites do not currently have specific remediation goals. In the 300 area, remediation goals require excavation of soils with greater than 350 pCi/g of total uranium. The detection limit currently required for use in characterization is 50 pCi/g, but a lower detection limit may be needed in the future.

Work Breakdown Structure (WBS) No. : 1.4.03.1.1 (RL-RC01) ***TIP No.:*** N/A
1.4.03.1.2 (RL-RC02)
1.4.03.3.1 (RL-CP01)

Relevant PBS Milestone: PBS-MC-026, PBS-MC-027, PBS-MC-028

***Justification For Need*:**

Technical: Current technology can measure high-end concentrations of gamma emitters but new technology is needed to accurately measure the low-end concentrations of alpha and beta emitters.

Regulatory: None.

Environmental Safety and Health: Rapid screening techniques will reduce worker exposure times and help assure that all soil contaminated above regulatory limits is removed and all contaminated sites are located.

Potential Life-Cycle Cost Savings of Need (in $000s) and Cost Savings Explanation:
The estimated life-cycle cost savings associated with filling this need is $1M. This estimate is based on an assumed savings of 0.1% of the total cost for the 100 Area of $900M.

Cultural/Stakeholder Concerns: None.

Other: None.

Current Baseline Technology: Gamma detectors and discrete sampling.

Cost: Cost of equipment and analyses to support excavation are minimal but hidden costs related to reduced excavation efficiency could be substantial. Baseline characterization activities in the 200 Areas are estimated to be $70M.

Cost per unit: Not determined.

Waste: Laboratory waste generated from discrete sampling.

How Long It Will Take: Soil remediation activities in the 100 and 300 Areas are planned for the next ten years. Soil activities in the 200 Area are scheduled to continue through 2018.

End-User: Richland Environmental Restoration Project

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